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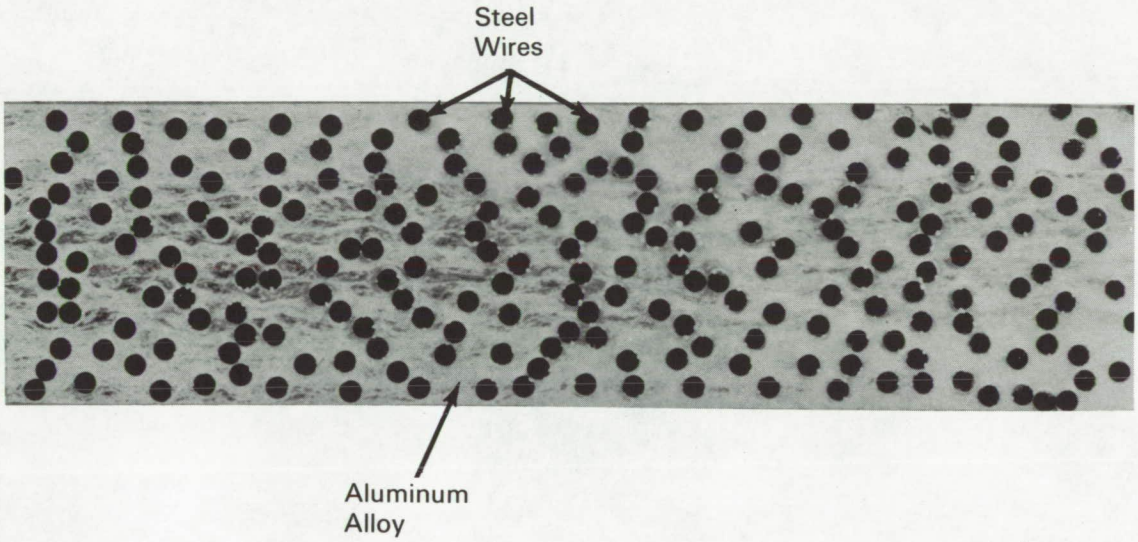
Brief 66-10262

NASA TECH BRIEF

Aluminum/Steel Wire Composite Plates Exhibit High Tensile Strength



The problem:

In the building of structures subject to high stresses, aluminum alloy plate and sheet material may not have sufficient strength, while steel alloys are sufficiently strong but impose a serious weight penalty. A compromise material is needed that exhibits high tensile strength without the weight penalty.

The solution:

A composite plate of fine steel wires imbedded in an aluminum alloy matrix results in a plate much stronger than an all aluminum alloy plate and much lighter than a steel plate.

How it's done:

A composite plate is made by rolling 0.010-inch carbon steel wire into grooved plates of 2219-T81 aluminum alloy and diffusion bonding the plates into a matrix 3/4-inch thick. Tensile strength of the composite is 158,000 psi. The alloy alone has a tensile strength of 70,000 psi; the wire has a tensile strength near 500,000 psi.

In another technique, nine grooved layers of 7178 aluminum alloy and eight alternate layers of 0.009-inch NS355 wire are hot pressed at 875°F for 1/2 hour. Initial tensile strength of the composite is 139,300 psi and increases to 158,000 psi after solution heat-treatment and aging. Nominal strengths are 83,000 psi for the aluminum alloy and 480,000 psi for the wire.

Notes:

1. Composite plates have been prepared having the strength of titanium with only 85% its density.

(continued overleaf)

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B66-10262

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Harvey Aluminum Company
under contract to
Marshall Space Flight Center
(M-FS-401)